Claims

1. A fuel cell comprising:

a cell unit that is formed by arranging a cathode catalyst layer on one surface of a proton exchange membrane and an anode catalyst layer on another surface of the proton exchange membrane;

a first plate on which fuel channels for supplying a fuel are formed; and

a second plate on which (a) oxidant channels for supplying an oxidant and (b) ribs are formed, the second plate and the first plate sandwiching the cell unit in such a manner that the oxidant channels and the ribs face the cathode catalyst layer and the fuel channels face the anode catalyst layer,

wherein a gas diffusion layer is interposed between the cathode catalyst layer and the second plate, and

at least one of the gas diffusion layer and the cathode catalyst layer is constructed in such a manner that water retentivity is higher in parts facing the oxidant channels than in parts facing the ribs.

2. The fuel cell of Claim 1,

wherein the at least one of the gas diffusion layer and the cathode catalyst layer is constructed in such a manner that, in a vicinity of an inlet for the oxidant, water retentivity is higher in the parts facing the oxidant channels

than in the parts facing the ribs.

3. The fuel cell of Claim 1,

wherein the at least one of the gas diffusion layer and the cathode catalyst layer is constructed in such a manner that, in a predetermined region extending from an oxidant inlet side end of the at least one of the gas diffusion layer and the cathode catalyst layer toward an oxidant outlet side thereof, water retentivity is higher in the parts facing the oxidant channels than in the parts facing the ribs.

4. The fuel cell of Claim 3,

wherein a size of the predetermined region is in a range of 10% to 90% inclusive of a size of an entire region extending from the oxidant inlet side end of the gas diffusion layer to an oxidant outlet side end thereof.

5. The fuel cell of any of Claims 1 to 4,

wherein the gas diffusion layer is made of a conductive base material that contains a water repellent material, and an amount of the water repellent material in the gas diffusion layer is smaller in the parts facing the oxidant channels than in the parts facing the ribs.

6. The fuel cell of Claim 5,

wherein the gas diffusion layer is constructed in such a manner that a ratio of (a) the amount of the water repellent material in the parts facing the oxidant channels with respect to (b) the amount of the water repellent material in the parts facing the ribs is in a range of 0.2 to 0.8 inclusive.

7. The fuel cell of any of Claims 1 to 4,

wherein the gas diffusion layer has a water retentivity adjustment layer that is formed by applying a mixture containing carbon particles, and

the water retentivity adjustment layer is constructed in such a manner that water retentivity is higher in parts facing the oxidant channels than in parts facing the ribs.

8. The fuel cell of Claim 7,

wherein in the gas diffusion layer, carbon particles that are used in the parts facing the oxidant channels have higher water retentivity than carbon particles that are used in the parts facing the ribs.

9. The fuel cell of Claim 7,

wherein in the gas diffusion layer, carbon particles that are used in the parts facing the oxidant channels have a larger specific surface area than carbon particles that are used in the parts facing the ribs.

10. The fuel cell of Claim 7,

wherein the water retentivity adjustment layer is formed by applying a mixture of carbon particles and a water repellent material, and

a ratio of (a) an amount of the water repellent material in a mixture applied in the parts facing the oxidant channels with respect to (b) an amount of the water repellent material in a mixture applied in the parts facing ribs is in a range of 0.2 to 0.8 inclusive.

11. The fuel cell of Claim 1,

wherein the cathode catalyst layer is made of a mixture of (a) carbon particles that support a catalyst and (b) an ion exchanger, and

carbon particles that are used in the parts facing the ribs have a larger specific surface area than carbon particles that are used in the parts at an oxidant outlet side.

12. The fuel cell of Claim 1,

wherein the cathode catalyst layer is made of a mixture of (a) carbon particles that support a catalyst and (b) an ion exchanger, and

an amount of the ion exchanger in the cathode catalyst layer is larger in the parts facing the oxidant channels than

in the parts facing the ribs.

13. A fuel cell comprising:

a cell unit that is formed by arranging a cathode catalyst layer on one surface of a proton exchange membrane and an anode catalyst layer on another surface of the proton exchange membrane;

a first plate on which fuel channels for supplying a fuel are formed; and

a second plate on which (a) oxidant channels for supplying an oxidant and (b) ribs are formed, the second plate and the first plate sandwiching the cell unit in such a manner that the oxidant channels and the ribs face the cathode catalyst layer and the fuel channels face the anode catalyst layer,

wherein a gas diffusion layer and an intermediate water retentive layer that contains an ion exchanger are interposed between the cathode catalyst layer and the second plate, the intermediate water retentive layer being positioned closer to the cathode catalyst layer than the gas diffusion layer, and

the intermediate water retentive layer is constructed in such a manner that water retentivity is higher in parts facing the oxidant channels than in parts facing the ribs.

14. The fuel cell of Claim 13,

wherein the intermediate water retentive layer is provided in a predetermined region extending from an oxidant inlet end toward an oxidant outlet side.

15. The fuel cell of Claim 14,

wherein a size of the predetermined region is in a range of 10% to 90% inclusive of a size of an entire region extending from the oxidant inlet side end of the gas diffusion layer to an oxidant outlet side end thereof.

16. The fuel cell of any of Claims 13 to 15,

wherein the intermediate water retentive layer contains a larger amount of the ion exchanger in the parts facing the oxidant channels than in the parts facing the ribs.

17. The fuel cell of any of Claims 13 to 15,

wherein in the intermediate water retentive layer, an ion exchanger that is used in the parts facing the oxidant channels has a larger ion-exchange capacity than an ion exchanger that is used in the parts facing the ribs.

18. The fuel cell of any of Claims 13 to 15,

wherein the ion exchanger is selected from the group consisting of a perfluoro carbon sulfonic acid, a polystyrene sulfonic acid, a polybenzimidazole sulfonic acid, and a

polyether ketone sulfonic acid.

19. The fuel cell of any of Claims 13 to 15, wherein in the intermediate water retentive layer, an amount of the ion exchanger contained in the parts facing the oxidant channels is in a range of $0.02 mg/cm^2$ to $0.12 mg/cm^2$ inclusive.